Alsace-Lorraine. The exhibition will keep open from July 15 to the end of November, but a limit will be imposed on exhibitors sending in their applications.

On April 27 an earthquake was felt at Florence, and also at Bologna. The Florence commotion was very slight, but had been preceded by other movements of a similar nature, which ought not to pass unnoticed, especially in connection with the seismic manifestations felt in Germany, as mentioned in our last impression.

Mr. Rowland Ward writing to the *Standard*, states that in making the excavation at Charing Cross for Messrs. Drummonds' new bank, the workmen, at depths varying from fifteen to thirty feet, came upon the fossil remains of various extinct animals. They include elephant tusks and molars (probably the mammoth *Elephas primigenius*), teeth and numerous bones of the gigantic extinct ox (*Bos primigenius*), a portion of the horn of the great extinct Irish deer (*Megaceros hibernicus*), along with various other remains of ruminating animals not yet identified. The specimen in this series which has specially attracted notice is the extreme end of a tusk unusually sharp at the point and highly polished, and from a portion of the surface of which a very thin skin of ivory peels off, exposing a strongly and regularly longitudinally channelled surface beneath.

Mr. Watson Lyall's "Sportsman's and Tourist's Guide" improves every year. It has now reached its seventh year, and is evidently a great success. The information as to shootings, rivers, lochs, &c., of Scotland is as full as could be, and is evidently kept well up to date. It deserves all the success it has obtained. In this connection we greatly regret to see that the disease which we referred to last year as having broken out among the Solway salmon has reappeared this year, not only in the Solway rivers, but in the Tweed. Mr. Sterling, of the Edinburgh Anatomical Museum, found it to be a branching fungus (*Saprolegnia ferax*), which, first attacking the scaleless parts, rapidly spreads over the whole fish. The disease has not yet appeared north of the Tweed. Sir Robert Christison recommends a Royal Commission, and the careful watching of all salmon and trout streams, whether affected or not.

We are glad to see from its Twenty-first Report that the East Kent Natural History Society is fulfilling its functions, though under many disadvantages.

We have already referred to the forthcoming annual meeting, at Leicester, of the Midland Union of Natural History Societies. Those interested in the meeting will find further details in our advertisement columns.

In Prof. Jevons's article (vol. xix. p. 588), second column, line 18, for "a seer is equal to about 21 lb. avoirdupois," read "a seer is equal to about 2 lb. avoirdupois." The error is a purely typographical one, and does not affect any other statements in the article. Mr. E. H. Pringle asks us to state that in his letter (vol. xx. p. 6), "such distances as six," &c., should be "such heights as six," &c., and "mountain 20,000 feet high (less than 4 miles)" should be "mountain 10,000 feet high (less than 2 miles)." He thinks it may be worth mentioning that Raoul or Sunday Island, in the Kermadecs, has an elevation of 1,627 feet, commanding a sea horizon of nearly 50 miles radius.

The additions to the Zoological Society's Gardens during the past week include a Bonnet Monkey (*Macacus radiatus*) from India, presented by Mr. E. Brett; a Pig-tailed Monkey (*Macacus nemestrinus*), from Java, presented by Mr. E. M. Clissold; a Black-faced Spider Monkey (*Ateles ater*) from Eastern Peru, two Passerine Ground Doves (*Chamæpelia passerina*) from America, presented by Capt. H. King; an Ocelot (*Felis pardalis*) from America, presented by Mr. B. H. Jones; a Crab-eating Raccoon (*Procyon cancrivorus*) from South America, presented by Mr. Bridget; a Long-tailed Marmot (*Arctomys caudata*) from Bhootan, presented by Capt. Greenstreet, R.E.; a Silver Pheasant (*Euplocamus nycthemerus*) from China, presented by Mr. E. J. Beagle; a Small Hill Mynah (*Gracula religiosa*) from South India, presented by Mr. J. W. Wodler; five Water Ouzels (*Cinclus aquaticus*), British Isles, presented by Mr. F. Swabey; an Anaconda (*Eunectes murinus*) from South America, presented by Mr. G. H. Hawtayne, C.M.Z.S.; a Teguexin Lizard (*Teius teguexin*) from South America, a Leopard Tortoise (*Testudo pardalis*) from South Africa, purchased; a Tamandua Ant-eater (*Tamandua tetradactyla*) from South America, a Great American Egret (*Ardea egretta*) from America, deposited; a Reeves's Muntjac (*Cervulus reevesi*) born in the Gardens.

RECENT CONTRIBUTIONS TO THE HISTORY OF DETONATING AGENTS[1]

II.

That the power possessed by different very highly explosive substances, of inducing the detonation of such bodies as gun-cotton and nitro-glycerine, is not solely ascribable to the operation of mechanical force very suddenly developed, is indicated not only by the singular inertness of gun-cotton to the influence of nitro-glycerine as a detonating agent, but also by a comparison of the behaviour of other detonating substances with that of the mercuric fulminate, when applied to the detonation of gun-cotton. Thus the detonation of silver fulminate is very decidedly sharper than that of the mercury compound, yet it is in no way superior to the latter in its power as an initiative detonating agent; indeed, a somewhat larger amount of it appeared to be required than of the mercury salt to induce detonation of gun-cotton with certainty. Again, the iodide and chloride of nitrogen are far more susceptible of sudden detonation than the silver fulminate; yet while 5 grains of the latter, confined in a stout metal envelope, suffice to detonate gun-cotton, 50 grains of chloride of nitrogen confined by water, appeared to be the minimum amount with which the detonation of gun-cotton could be accomplished with certainty, while no success attended the employment of confined iodide of nitrogen in quantities ranging up to 100 grains.

The incompatibility of these results with the general conclusion, based upon numerous and greatly varied experiments, that the facility with which the detonation of gun-cotton and nitro-glycerine, and bodies of a similar character as explosives, is induced by an initiative detonation, is proportionate to the mechanical force aided by the heat developed by the latter, led the lecturer to the conclusion that a synchronism or similarity in character or quality of the vibrations developed by the detonation of particular substances, operates in favouring the detonation of one such substance by the initiative detonation of a small quantity of another, while in the absence of such synchronism, a much more powerful detonation, or the application of much greater force, would be needed to effect the detonation of the material operated upon. This view has received considerable support from results since obtained by other experimenters, especially by MM. Champion and Pellet; but the subject is one which still needs further experimental elucidation.

The physical character of explosive substances, as also the mechanical condition of a mass of the particular explosive substance operated on, are of great influence in determining its behaviour when submitted to the action of an initiative detonation. The liquid nitro-glycerine is far more sensitive to detonation than gun-cotton; one grain of mercuric fulminate, confined in a metal case, suffices to detonate nitro-glycerine when surrounded by it; but, in order to attain this result with any degree of certainty, it is necessary so to confine the nitro-glycerine as to prevent its yielding to the blow developed by the initiative detonation, and thus to some extent escaping from the operation of the sudden concussion to which the particles contiguous to the fulminate charge are submitted.

If nitro-glycerine be mixed with solid substances in a fine state of division, plastic mixtures may be obtained, and the liquid may thus be presented in something like a solid form to the detonating agent; if the particles of absorbent material be, moreover, of porous nature, as is the case with the infusorial earth called kieselguhr, used in the production of dynamite, a solid nitro-glycerine preparation may be obtained which contains a very large proportion of the liquid (75 per cent. by weight). In this condition nitro-glycerine may be detonated without any difficulty when freely exposed to air; and although it is diluted with a considerable proportion of absolutely inert material, its sensitiveness to detonation is not in the least diminished. Each particle of the diluent is enveloped in the liquid, so that no portion of the latter becomes isolated from the remainder by the admixture of inert solid matter; hence, when the initiative detonator is surrounded by such a mass, it is in contact at all points with some portion of the nitro-glycerine, and the latter is in continuous connection throughout, though no longer in a mobile condition; detonation is consequently as readily established and transmitted through the mass as though it consisted entirely of nitro-glycerine. Indeed, while the liquid in its undiluted state, if freely exposed to air in a long layer, transmits detonation with difficulty, and very slowly as compared with compressed gun-cotton (the observed rate of progression being, in several experiments, below 6,000 feet per second), detonation is transmitted with ease and certainty through very long trains of a solid preparation of nitro-glycerine, such as dynamite, and the rate of transmission is decidedly more rapid than it is with compressed gun-cotton, a result which is in harmony with the greater sensitiveness to detonation and the greater violence of action of nitro-glycerine.

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[1] Weekly Evening Lecture at the Royal Institution, Friday, March 21, 1879. By Professor Abel, C.B., F.R.S. Revised by the Author. Continued from p. 21.

It has already been stated that gun-cotton may be detonated if a confined charge of not less than two grains of mercuric fulminate be detonated when closely surrounded by the substance. But in order to attain this result, the cellulose-product must be presented to the detonating agent in a mechanical condition favourable to its action.

Gun-cotton in a loose flocculent condition, or even if in the more compact form of a spun yarn or thread, cannot be detonated through the agency of a large charge of fulminate buried in the material. It is simply scattered with violence, portions being sometimes inflamed by the heat developed where the fulminate is detonated. If however, the gun-cotton be converted into a compact form, either by ramming the wool or thread very tightly into a case, or better still, by reducing the gun-cotton fibre to a very fine state of division, and then compressing it into compact masses, it becomes susceptible of detonation by the initiative action of mercuric fulminate, and the quantity of the latter required to bring about detonation is small in proportion as the compactness or density of the compressed material is increased.

Detonation, when established in compressed gun-cotton, is transmitted with great velocity throughout the mass, as already stated, or from one to another of contiguous masses, and even, though at a reduced rate, if small spaces exist between the individual masses. But, if a small mass of compressed gun-cotton freely exposed to air be detonated when in immediate contact with gun-cotton wool or loosely-twisted yarn, the detonation will not be transmitted to these, but they will merely be scattered and perhaps inflamed.

The difference in the behaviour of nitro-glycerine and of gun-cotton when presented to the action of a so-called initiative detonation under the different conditions spoken of above, admits of ready explanation.

It has been thoroughly established that the action of an initiative detonation is not ascribable to the heat developed within the detonating material itself, in undergoing chemical metamorphosis. Its action has already been compared to that of a blow from a hammer or falling weight. The readiness and certainty with which gunpowder, gun-cotton, and other explosive agents are detonated by the latter agency are regulated by several circumstances; they are in direct proportion to the weight of the falling body, to the height of its fall, and to the force with which it is impelled downwards; to the velocity of its motion; to the mass and rigidity or hardness of the support upon which the substance to be detonated rests; lastly, to the quantity and mechanical condition of the explosive agent struck, and to its sensitiveness.

Gunpowder is much more readily detonated by a sharp blow from a small hammer than by the simple fall of a heavy hammer, or by a comparatively weak blow from the latter. It is very difficult by repeated blows, applied at very brief intervals, to detonate gun-cotton if placed upon a support of wood or lead, both of which materials yield to a blow, the force applied by that blow being transferred through the explosive agent and absorbed in work done upon the material composing the support. But if the latter be of iron, which does not yield permanently to the blow of the hammer, the detonation of those substances is easily accomplished. If the quantity of the explosive agent employed be so considerable as to form a thick layer between the hammer and support, the force applied is to so great an extent expended in imparting motion to the particles of the compressible mass, that there remains little or none by which its detonation can be accomplished, and if the material be in a loose or porous condition (as in the case of a powder or of loose wool), much work has to be accomplished in moving particles of the mass through a comparatively considerable space, in the operation of compressing them, so that a second or even a third blow is required for their detonation; whereas if, by blows or pressure previously applied, the explosive material will be presented in the form of a compact mass, the particles of which have little tendency to motion when force is applied to them, detonation will be much more readily developed. It appears, therefore, that the detonation of an explosive substance by means of a blow is the result of the development of heat sufficient to bring about most energetic chemical action, or change, by expenditure of force in the compression of the material, or by establishing violent friction between its particles, consequent upon the motion momentarily imparted to them, and that it is brought about with a readiness proportionate to the resistance which they oppose to their motion by the degree of their contiguity to each other.

The exceedingly violent motion of particles resulting from the sudden or extremely rapid transformation of a solid or liquid explosive body into highly heated gas or vapour (which is the effect of a detonation), must obviously exert force which operates upon a body opposed to it in a manner precisely similar to the force applied by opposing a body in the path of a solid mass which is set into very rapid motion. The power of accomplishing the detonation of nitro-glycerine, gun-cotton, or other highly explosive substances, freely exposed to the air, through the agency of detonation produced in their vicinity or in close contact with them, appears therefore correctly ascribable to the heat suddenly developed in some portion of the mass by the mechanical effect, or blow exerted by that detonation, and is regulated by the violence and suddenness (either singly or combined) of the detonation, by the extent to which the particles composing the mass of the explosive material are in a condition to oppose resistance to the force, and by the degree of sensitiveness of the substance to detonation, or to sudden metamorphosis, under the influence of heat thus developed.

It will now be evident why the readily yielding nature of the particles of liquid nitro-glycerine tends to counteract its great sensitiveness to detonation, and why, when the motion of the liquid particles is impeded by their admixture with solid matter, and when they are consequently placed in a position to resist mechanical motion by the force applied through the agency of detonation, its natural sensitiveness to detonation, and the rapidity with which it can be transmitted from particle to particle become fully developed.

Again, the reduction of gun-cotton fibre to a fine state of division, which renders the material readily convertible into very compact and dense masses, places the particles in the condition most favourable to resist mechanical motion upon the application of a blow, or of the concussion resulting from a detonation; hence, compressed gun-cotton is readily susceptible of detonation in proportion to the extent of compression, or to its density and compactness, while loose gun-cotton wool, or the lightly twisted or compressed material cannot be readily detonated, because the force applied is expended in imparting motion to the readily yielding particles of the mass. If the force applied through the agency of a detonator to a mass of explosive material just borders upon that required for the development of the detonation, or if the condition of the mass is such as hardly to present the requisite resistance to mechanical motion essential for its detonation, then, results intermediate between the mechanical dispersion of the mass and its violent chemical dispersion or disintegration, *i.e.*, detonation, are obtained. Thus, frequent instances have been observed, especially in the experiments in the transmission of detonation through tubes, in which the initiative detonation has brought about an explosion attended with little, if any, destructive effect, portions of the mass being at the same time dispersed and occasionally inflamed. Even silver fulminate, which under ordinary conditions detonates violently, even when only a particle of the mass is subjected to a sufficient disturbing influence, has been exploded without the usual demonstrations of force, by the transmitted effect of a detonation of mercuric fulminate. In these instances the violence of the concussion produced by the initiative detonation was only just bordering on that required for the development of detonation, and it appears probable that only some small portion of the mass operated upon was in a condition or position favourable to the action of the initiative blow. The remainder of the mass would then be dispersed by the gases developed from the detonated portion; in some instances the particles would be inflamed at the moment of their dispersion, in others, they would even escape ignition.

Some experiments made in firing at masses of compressed gun-cotton, differently arranged and of different thicknesses, with a Martini-Henry rifle, at short ranges, afforded interesting confirmation of the correctness of the explanation given of the operation of a blow upon masses of explosive material under different conditions. Disks of gun-cotton of the same density and diameter, but differing in thickness, were fired at; they were freely suspended, and their distance from the marksman was in all instances 100 yards. The thinnest disks were simply perforated by the bullets; somewhat thicker disks were inflamed by the impact of the bullet, while still thicker disks, fired at under the same conditions, were exploded. No instance of detonation was, however, obtained. These differences in effect, obtained with masses of different thickness and weight, are due to the difference in their power to resist mechanical motion when struck by the bullet, and in the different amount of resistance to penetration presented by the thin and the thicker disks.

It has been explained that nitro-glycerine may be largely diluted with inert solid matters without its sensitiveness to detonation being reduced, while its detonation in open air becomes very much facilitated, because the tendency of its particles to yield to the force of a blow or detonation, is very greatly diminished. But if a *solid* explosive agent is diluted with inert *solid* matter the case is different; for in such a mixture of the finely divided solid with non-explosive solid particles, there must be a partial and sometimes a complete separation of the particles of the explosive by the interposed inert particles with which it is diluted; hence the sensitiveness to detonation is reduced, and its transmission by the particles is retarded or altogether impeded, by a diminution of the extent of contact between the substance to be detonated and the initiative detonation, and by the barrier which the interposed non-explosive particles oppose to the transmission of detonation. In experiments made in this direction with finely divided gun-cotton, it was found that although dilution with an inert solid, applied in the *solid form*, reduced the sensitiveness of the material to detonation, this was not the case when it was incorporated with a salt soluble in water, the mixture being then compressed while in the wet state. The compressed masses thus obtained were, when dried, in a condition of greater rigidity than could be attained by submitting undiluted gun-cotton to considerably more powerful pressure, because the crystallisation of the soluble salt used as the diluent upon evaporation of the water, cemented the particles composing the mass more rigidly together. The gun-cotton was therefore presented in a form more capable of resisting the mechanical action of a small charge of fulminate, than a more highly compressed undiluted gun-cotton, and hence the reduction in sensitiveness due to the detonation of the explosive compound is nearly counterbalanced by the greater rigidity imparted to the mass. If a soluble oxidising agent (a nitrate or chlorate) be employed as the diluting material, the predisposition to chemical reaction between it and the gun-cotton (which is susceptible of some additional oxidation), appears to operate in conjunction with the effect of the salt in imparting rigidity to the mixture, thus rendering the latter quite as sensitive to the detonating action of the minimum fulminate charge as undiluted gun-cotton. Moreover, the interesting fact has been conclusively established, that these compressed mixtures of gun-cotton with a nitrate or a chlorate are much less indifferent to the influence of detonating nitro-glycerine than gun-cotton in its pure state, chlorated and nitrated gun-cotton being detonated with certainty by means of ½ oz. of nitro-glycerine.

If compressed gun-cotton is diluted by impregnating the mass with a *liquid*, or with a solid which is introduced into the mass in a fused state, its susceptibility of detonation is reduced to a very much greater extent than by a corresponding quantity of a solid inert body, incorporated as such with the gun-cotton, the cause being the converse of that which operates in preventing a reduction of the sensitiveness to detonation of nitro-glycerine by its dilution with an inert solid. In this case the explosive liquid envelopes the solid diluent, and remains continuous throughout, occupying the spaces which exist between the solid particles; hence detonation is readily established and transmitted. But in the case of the solid explosive the diluent, which is liquid, or at any rate is introduced into the mass in the liquid state, envelopes each particle of the solid, so that a film of inert material surrounds each, isolating it from its neighbours, and thus opposing resistance to the transmission of detonation, which is proportionate to the original porosity or absorbent power of the mass.

While compressed gun-cotton, in the air-dry state, is detonated by 2 grains of mercuric fulminate imbedded in the material, its detonation by 15 grains, applied in the same manner, becomes doubtful when it contains 3 per cent. of water, over and above the 2 per cent. which exists normally in the air-dry substance. Specimens which had been impregnated with oil or soaked in melted fat and allowed to cool could not be detonated by means of 15 grains of fulminate. These diluted samples of gun-cotton could only be detonated by adding very considerably to the power of the initiative detonation; 100 grains of confined fulminate generally failed to detonate gun-cotton containing from 10 to 12 per cent. of water, and if the amount reached 17 per cent., 200 grains of fulminate were needed to insure its detonation.

But moist or wet compressed gun-cotton is decidedly more susceptible of detonation by (dry) compressed gun-cotton itself than by mercuric fulminate.

Thus 100 grains of dry gun-cotton, detonated through the agency of the ordinary fulminate fuze, suffice to detonate wet gun-cotton containing 17 per cent. of water, though this result is somewhat uncertain. If the diluting agent amounts to 20 per cent., detonation is not certain with less than 1 oz. of dry gun-cotton, and if the compressed material be completely saturated with water (*i.e.*, containing 30 to 35 per cent.), 4 oz. of the air-dry substance, applied in close contact, are needed to insure its detonation.

Detonation is transmitted through tubes from dry compressed gun-cotton to a moist disk of the material with the same facility as to the dry substance; and this is also the case with regard to the propagation of detonation from one mass of moist gun-cotton to another, in open air, all the pieces being ranged in a row, in contact with each other, provided that the piece first detonated does not contain less water than the others to which detonation is transmitted.

Gun-cotton containing 12 to 14 per cent. of water is ignited with much difficulty on applying a highly heated body. As it leaves the hydraulic press upon being converted from the pulped state to masses having about the density of water, it contains about 15 per cent. of water; in this condition it may be thrown on to a fire or held in a flame without exhibiting any tendency to burn; the masses may be perforated by means of a red-hot iron or with a drilling tool, and they may with perfect safety be cut into slices by means of saws revolving with great rapidity. If placed upon a fire and allowed to remain there, a feeble flame flickers over the surface of the wet gun-cotton from time to time as the exterior becomes sufficiently dry to inflame; and in this way a piece of compressed gun-cotton will burn away very gradually indeed. A pile of boxes containing in all 6 cwt. of gun-cotton, impregnated with about 20 per cent. of water, when surrounded by burning wood and shavings in a wooden building was very gradually consumed, the gun-cotton burning as already described when the surfaces of the masses became partially dried. Quantities of wet gun-cotton of 20 cwt. each, packed in one instance in a large, strong wooden case, and, in the other, in a number of strong packing cases, have been placed in small magazines, very substantially constructed of concrete and brickwork. Large fires were kindled around the packages in each building, the doors being just left ajar. The entire contents of both buildings had burned away, without anything approaching explosive action, in less than two hours. This comparatively great safety of wet gun-cotton, coupled with the fact that its detonation in that condition may be readily accomplished through the agency of a small quantity of dry gun-cotton, which, through the medium of a fulminate fuse or detonator, is made to act as the initiative detonating agent, gives to gun-cotton important advantages over other violent explosive agents for purposes which involve the employment of more or less considerable quantities at one time, on account of the comparative safety attending its storage and the necessary manipulation of it. Moreover, it has been well established by experiments of many kinds carried out on a considerable scale, as well as by accurate scientific observations, that the detonation of wet gun-cotton is decidedly sharper or more violent than that of the dry material; a circumstance which affords an interesting illustration of the influence exerted by the physical condition of the mass upon the facility with which detonation is transmitted from particle to particle. In the determinations made by means of the Nobel chronoscope, of the velocity with which detonation is transmitted along layers or trains of gun-cotton and nitro-glycerine, the lecturer has included experiments with gun-cotton containing different proportions of water. When the material contained 15 per cent. of the liquid, some indications were obtained that the rate of transmission of detonation was a little higher than with dry gun-cotton; the difference was very decidedly in favour of wet gun-cotton, when the latter was thoroughly *saturated* with water. The air in the masses of compressed gun-cotton being replaced entirely by the comparatively incompressible body, water, the particles of explosive are in a much more favourable condition to resist displacement by the force of the detonation, and hence they are more readily susceptible of sudden chemical disintegration. Moreover, the variations in the rate of travel of detonation in dry gun-cotton, resulting from differences in the compactness or rigidity of different masses of the material, are very greatly reduced, if not entirely eliminated, by saturating the disks with water, and thus equalising their power of resisting motion by a sudden blow.

Another striking illustration of the influence which the physical character of an explosive substance exercises over its susceptibility to detonation and the degree of facility with which its full explosive force is developed, is furnished by one of the most recently devised, and one of the most interesting of existing, explosive agents.

Twelve years ago, soon after the process of producing compressed and granulated gun-cotton had been elaborated by the lecturer, it occurred to him to employ these forms of gun-cotton as vehicles for the application of nitro-glycerine. A considerable proportion of the liquid was absorbed by the porous masses of gun-cotton, and a nitro-glycerine preparation analogous in character to dynamite was thus obtained. The absorbent was in this case a violently explosive body instead of an inert solid as in dynamite, but the quantity of nitro-glycerine in a given weight of the preparation (to which the name of glyoxilin was given), was considerably less than in the kieselguhr-preparation; hence the latter was nearly on a point of equality with it, in regard to power, as an explosive agent.

(*To be continued.*)

NOTES FROM RUSSIA

GEOGRAPHY AND ANTHROPOLOGY.—At the last meeting, April 23, of the Imperial Russian Geographical Society, M. Sreznefsky, the Secretary, communicated his monthly report on the work of the Society. This consisted in equipping three expeditions in which the Society intends to take part, and its participation in the Anthropological Exhibition of Moscow. The first expedition is the cruise of the steamer *Nordenskjöld*, equipped by the well-known merchant of Siberia M. Sibiriakoff, for the relief of Prof. Nordenskjöld in the *Vega*. It will proceed from Malmö direct to Yokohama, Behring Strait, and beyond. According to the request of M. Sibiriakoff the Society appointed to accompany the expedition M. A. W. Grigorieff, an accomplished botanist, known for his dredging work in the White Sea, where he collected very interesting specimens of marine fauna with deep soundings and temperature observations, by means of a Negretti and Zambra deep-sea thermometer. He proceeds to Malmö to join the expedition, with a Dent chronometer from the Society, and a complete provision for zoological collections, and a sufficient provision of alcohol.

The second expedition is sent out by the Ministry of Public Works, for the exploration of the old bed of the Amu-daria (Usboi), and to investigate the possibility of turning the river to the Caspian; it will be under the direction of Major-General A. T. Gloukhofskoi, an experienced traveller in Central Asia. The Society sends two Fellows with the expedition, a geologist, Prince Sedroiz, and the economist, N. A. Majef, the manager of the *Turkestan News*, a collector of varied statistical materials in Turkestan. The third expedition, of a private character, is to explore for a railroad from Orenburg to Tashkent, and the possibility of navigating with steamers the Sir and Amu-daria. By order of the Emperor a sum of 5,000 roubles is placed at the disposal of the Society.

The Anthropological Exhibition was opened in Moscow on April 15, under the superintendance of the Society, which has sent a great number of valuable objects of an ethnological character, with craniological collections and prehistorical specimens, tumuli excavations, and a valuable collection belonging to the Czarevich. All these collections were arranged by M. Sreznefsky, the Secretary of the Society, who was sent as its representative to the opening of the exhibition. The aim of this exhibition is: (1) To contribute to the development of anthropology as a science. (2) The foundation of an anthropological museum for the teaching of anthropology in the University of Moscow. (3) To popularise the science.

The exhibition is divided into sections—prehistorical, anthropological, medico-anthropological, photographical, ethnographical, the history of Russian types.

At the end of the meeting of the Society M. Alenitzin communicated his paper on the history of the Amu-daria question; he criticised the different opinions on the possibility of turning the Amu-daria into the Caspian, and doubted whether this question could be resolved practically and in a positive manner.

A. LOMONOSSOFF

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

THE Council of the Society of Arts having received an application from the City and Guilds of London Institute for the Advancement of Technical Education, offering to take charge of the technological examinations established by this Society in 1873, and carried on to the present time, have resolved to transfer these examinations to the charge of the Institute. The Council have also ascertained that the Science and Art Department will assist the City Institute in conducting the examinations, in the same way as it has hitherto assisted the Society of Arts. The technological examinations for the present year will, therefore, be carried on under the direction of the Institute, and all communications on the subject should be addressed to the Hon. Secretaries, City and Guilds of London Institute, Mercer's Hall, E.C.

THE following is the result of the recent examination for the Public Schools Prize Medals of the Royal Geographical Society: Physical Geography (examiner John Ball, F.R.S.), gold medal, Matthew George Grant; silver medal Frank Taylor Sharpe, both of Liverpool College. Honourably mentioned: E. G. Harmer, University College School; H. Ll. Smith, Bristol Grammar School; F. S. Carey, Bristol Grammar School; A. T. MacConkey, Liverpool College. Political Geography (examiner Canon Tristram, F.R.S.), gold medal, David Bowie, Dulwich College. Silver medal, Claude L. Bickwell, Harrow School. Honourably mentioned, J. F. Naylor, Dulwich College; W. H. D. Boyle, Eton; A. D. Rigby, Liverpool College; Theod. Brooks, London International College; R. A. Fawcett and A. C. Painter, of Clifton College.

ON May 1 an interesting ceremony took place at St. Barbe, the principal free institution at Paris. Two bodies of pupils were marched under the direction of teachers; the first was going to the Gare du Nord in order to come to London and spend six months in a corresponding English institution to learn the English language; the other went to the Gare de l'Est to proceed to Germany. These pupils have already learned foreign languages in Paris. They are placed under the supervision of professors, so that the usual routine of their studies for French honours should not be interrupted in any way.

SCIENTIFIC SERIALS

Annalen der Physik und Chemie, No. 3.—In view of contradictory results got by Sir W. Thomson and M. Le Roux, with regard to the thermo-electric behaviour of stretched wires, Herr Cohn has made a number of experiments, here described in an inaugural dissertation. He finds that the intensity of the thermo-current between stretched and unstretched wire of the same metal, depends (apart from all *permanent* properties), not only on the present tension of the former, but also, in very different